COC

Measures of Central Tendency

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Overview

1 Intro

2 Ideal Central Value

3 Discussion of A.M

4 Discussion of Median

5 Discussion Of Mode

6 Discussion of G.M & H.M

Introduction

A value which defines a data and all the observations of the data lie around it that value is known as "Central Value".

¨Basically; Central Value defines the uniformity of the data in respect of variability.

¨By using Central Value we are able to understand that most of the data lie around at which observations.
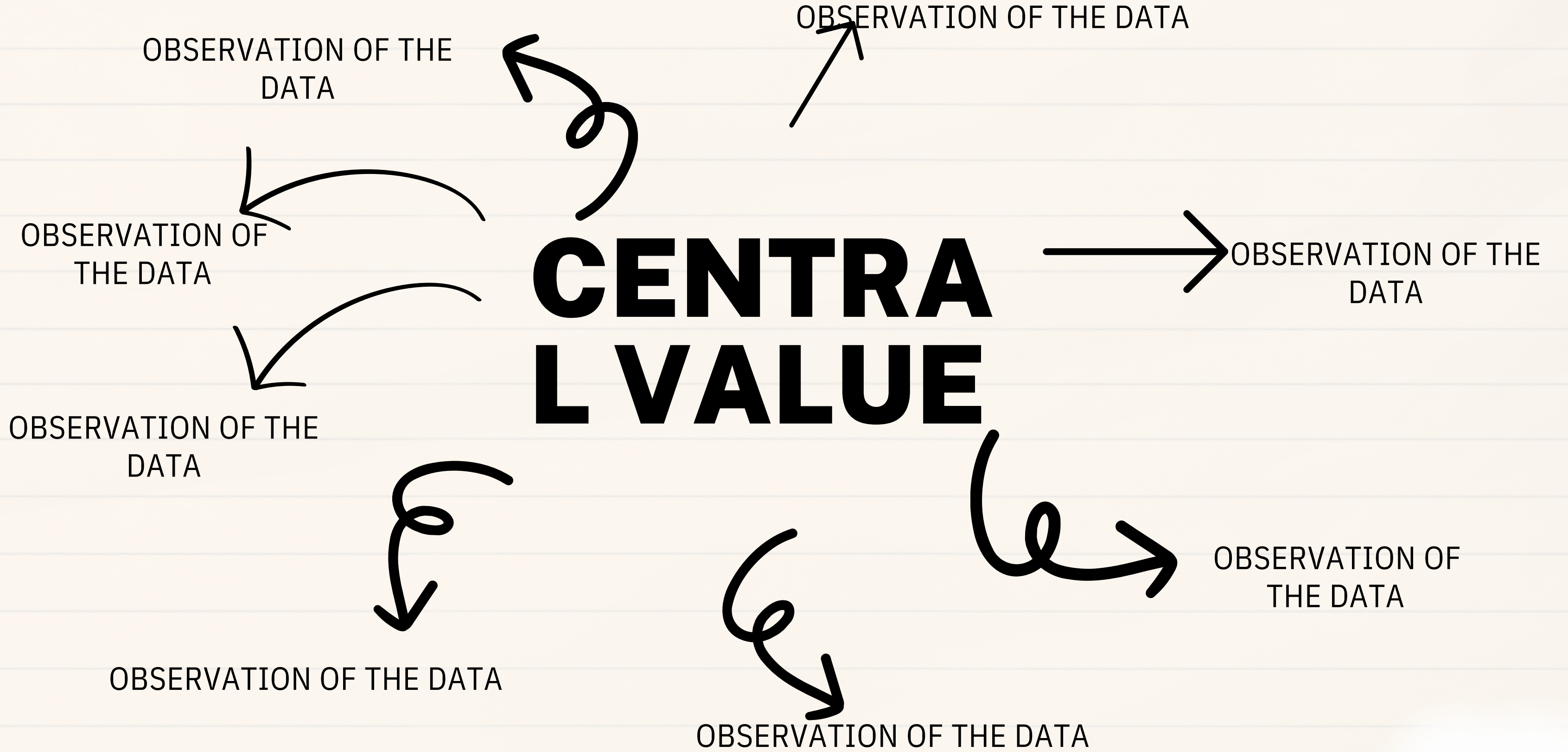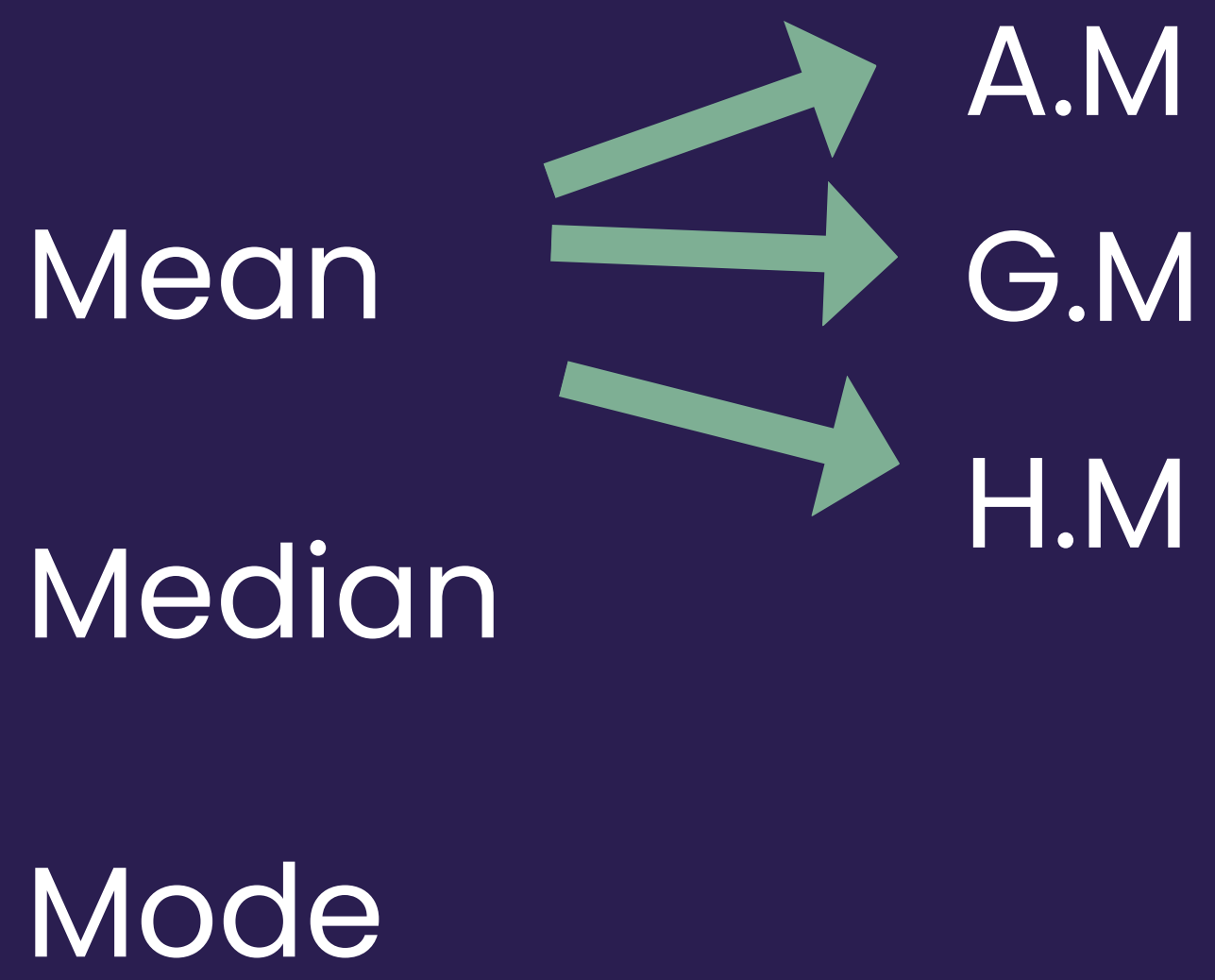
Alfredo

Olivia

KEY POINTS-

¨

¨Central Value has a unit and it is also affected due to addition/substraction of a value in each observations and it is also affected due to multiplication/divide of a value in each observations of the data.

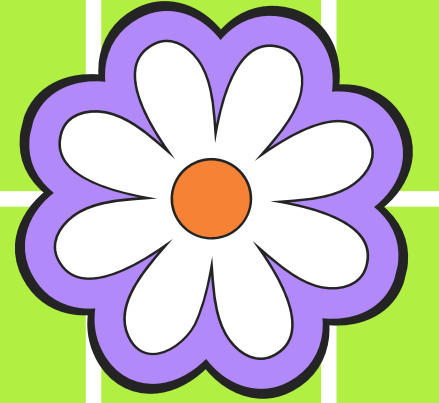¨Central Value plays a important role to understand any type of data.

CENTRAL VALUE

Mean → A.M
→ G.M
→ H.M

Median

Mode

NOTED TO BE-

Condition For Ideal Measure of Cental Tendency

- Properly Define.

- Based on all obsevation.

- Easy to calculate

- Have some mathematical properties.

- Descriptive

- Least affect due to presence of extreme of obsevations.
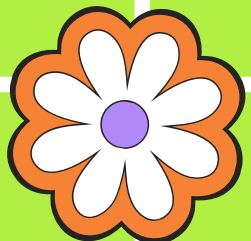
A.m-

When the sum of all observations is divided by total number of observations then the value is known as simple average or A.M of given observations.

It has a unit & it is a central value which is based on sum of all observations.

It shows always highest• average in respect of calculative average.

A.M is not ratio of sum of all observation to the total number of observations.

Q1. Find the value of x for which A.M of
3x + 2, 4x + 3, 5x + 7, x - 1 and 8 is 9 unit?
(a) 2
(b) 4
(c) 26
(d) None of these

Q2. If A.M of marks of 45 students in the class is 40 marks. After some time 3 students of marks 63, 42 and 55 marks respectively will leave the school then A.M of remaining students is-
(a) 38.08
(b) 39.047
(c) 39.47
(d) noneof these

Q3. If A.M of marks of 52 students in class is 46 marks. After some time 2 students of equal marks will leave the school and A.M change into 45 marks then the marks of each student who left are-

(a) 142
(b) 71
(c) 284
(d)noneof these
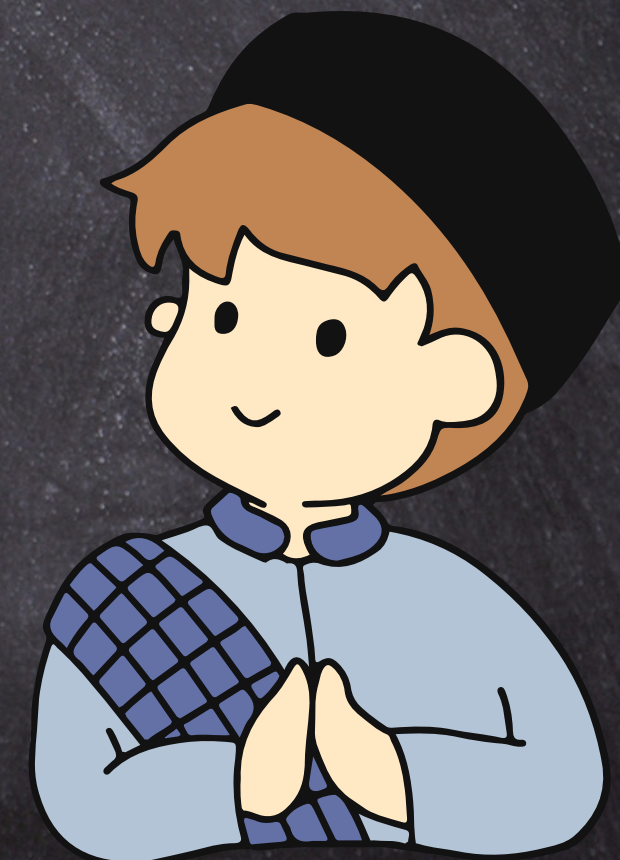
Q4. If A.M of marks of 48 students in the class is 48 marks. After some time 2 new students will admit in the school whose marks are 65 marks and 85 marks respectively then new A.M is-

(a) 49.8
(b) 49.08
(c) 49.008
(d) noneof these

Q5. If A.M of age of 15 students in the class is 12 years. After including a teacher A.M will increase by 1 year then the age of teacher is-

(a) 28
(b) 18
(c) 12
(d) none of these
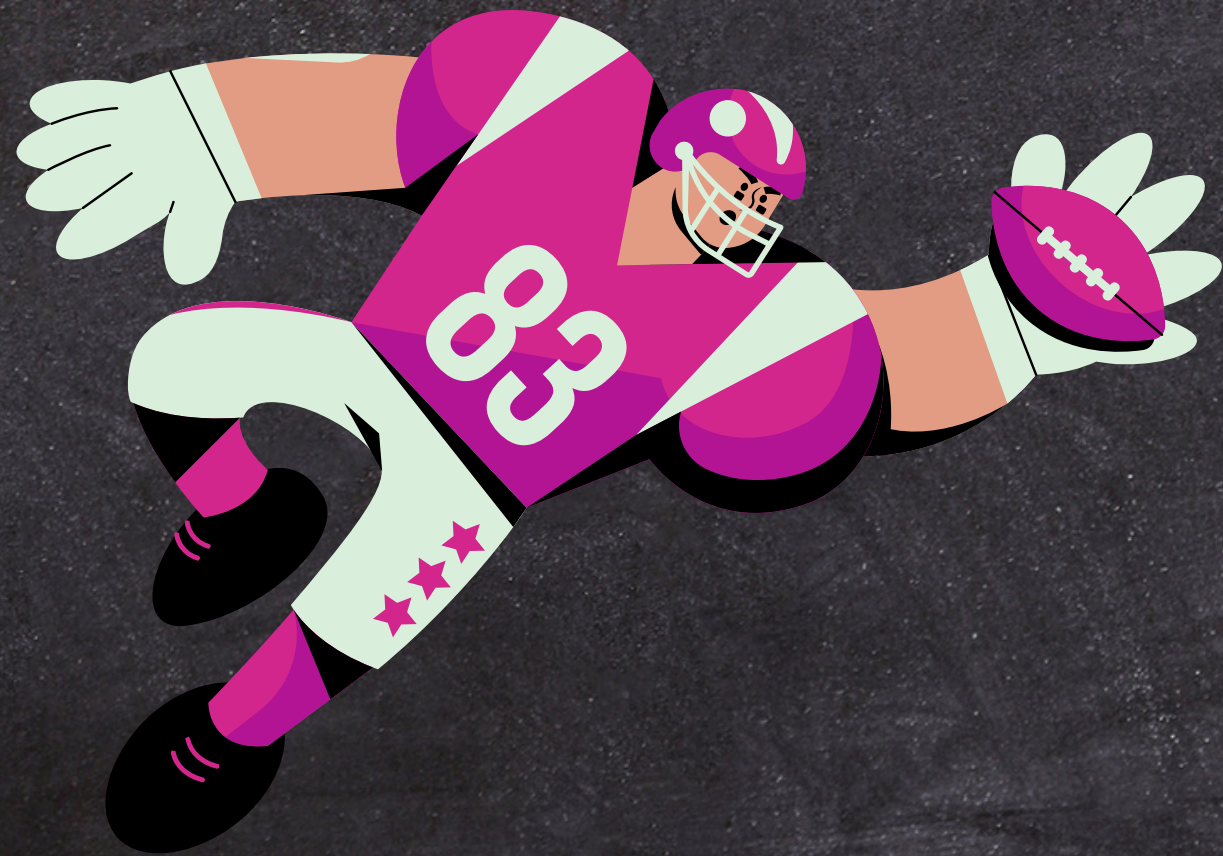
Q6. If A.M of marks of 45 students in the class is 36 marks. After some time it has been noted that the marks of 3 students were wrongly copied as 36, 18 and 91 instead of 63, 81 and 19 marks respectively then the correct A.M is-

(a) same
(b) 36.04
(c) 36.4
(d) none of these

Q7. If A.M of 60 boys and 40 girls are 38 marks and 56 marks respectively then the combined A.M is-

(a) 45.02 marks
(b) 45 marks
(c) 45.2 marks
(d) none of these

Q9. If A.M of wages of men and women are Rs. 19000 and Rs. 23000 respectively while the combined A.M is Rs. 20,000 then find

(i) Ratio of number of men to the number of women.

(ii) % of no. of women.

(a) 1:3 ,25%

(b) 3:1 ,25%

(c) 4:3 ,75%

(d) none of these

Q10. If A.M of marks by boys and girls are 45 marks and 62 marks respectively while combined A.M is 52 marks then % of number of girls is-

(a) 41.17%
(b) 58.83%
(c) both
(d) none of these

Discrete Series-

observations	Frequency

Continuous Series-

Direct Method-

Continuous Series-

Short-cut Method-

Continuous Series-   Step-Deviation Method-
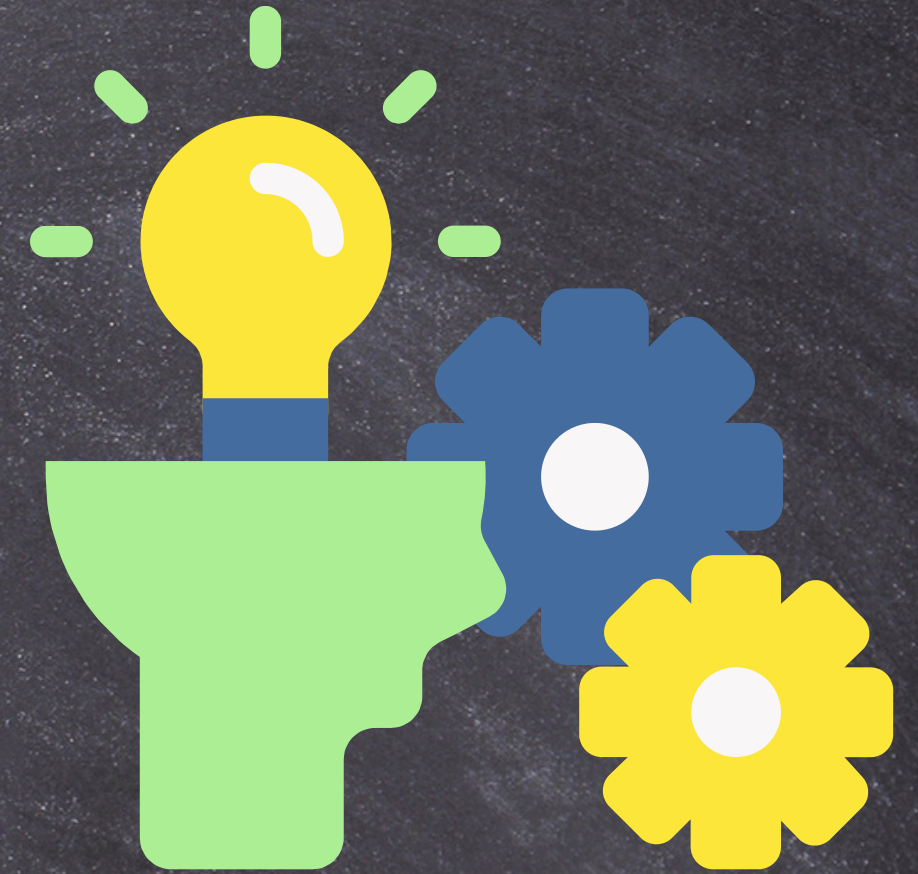
Properties of A.M-

1. If all observations of a statistical
   series are some are same say constant
'k' then   Mean = Median = Mode = K

2. "The algebraic sum of deviations of
observations from A.M is always zero.

$$\sum (\text{Observations-A.M})=0$$

3. "The sum of square deviations of observations from A.M is always minimum."

$$\sum (\text{observations} - \text{A.M})^2 = \text{Minimum}$$

4. A.M is affected due to change of origin (+, −) and also affected due to change of scale (×, /).

x change into y
Such that y = a + bx
Hera a - origin
b - scale
So

Q11. If A.M of x is 5 unit then find A.M of $(-2x+30)/10$?

Q12. If A.M of x is 4 unit and $3x - 4y = 10$ then find A.M of y?

(5) A.M is property define and descriptive.

(6) A.M is based on all observations and have some mathematical properties.

(7) A.M. shows greatest affect due to presence of extreme observations. This property is known as "Sampling fluctuation".

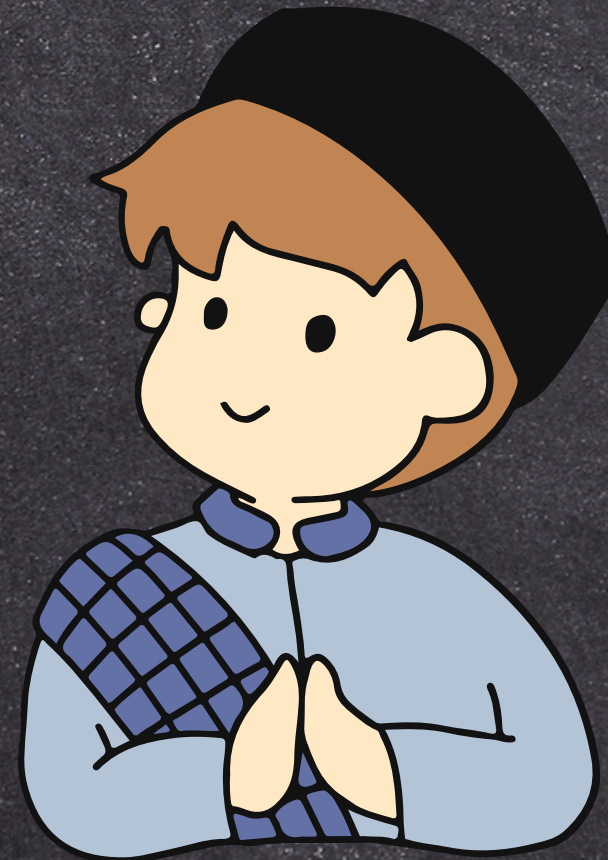(8) When all observations have unequal importance then we use "Weighted A.M"

Median ➡

¨A value which divides the given set of observations into two equal parts/halves o, then that value is known as "Median".

- It has a unit and also known as "Positional Average".

- Median is the middle-most value of any set of observation.

- It is the best Measure of central value for open-end classification.

(1) Individual Series

If N = odd then Median = ((N+1)/2)^th "obs."

If N = even then Median = (A.M of Middle most two values)

Here ((N+1)/2) "Rank of Median"

Median is the average which is calculated on behalf of Position.

IF NUMBER OF OBSERVATION IS ODD THEN

MEDIAN=A.M OF MIDDLE MOST TWO OBSERVATION

Median = {n+1}/2 th Observation

{n+1}/2 is Rank of Median

Here You have to Find Cumulative Frequency and then find that class in which rank of median will lie and then value of x of that class is Median

Discrete Series-

observations	Frequency

Continuous Series-

Median= n/2 th Observation

Step-1- First You have to calcullate Cumulative Frequency.
Step-2- you have to find that class in which rank of median
or any other partition value will lie.
Step-3- For that Class You have Find-

$$\text{Median} = L + \frac{(N/2 - C.f) \times i}{F}$$

Lower Liimit of that class (L)

Frequency Of that class (F)

Cumulative Frequency Of Preceeding class of that Median Class (c.f)

Continuous Series-

Class Interval	Frequency

Partition Values-   Number of Parts   Number of
                                              Partition Values   Each Partition Value %

Quartiles-

Deciles-

Percentile-=

The median of x , x/2 , x/3 , x/5 is 10 . Find x where x>0

(a) 24
(b) 32
(c) 8
(d) 16

- Median and all other partition value an also be obtained by using Ogive.

- In calculate of Partition Value of Ogive

  Absicca (x) - Partition Value

  Ordinate (y) - Part of the total observation.

- Both ogives are intersect to each other at (Median, N/2)

4. Median is affected due to change of origin (+, −) and also affected due to change of scale (×, /).

x change into y
Such that $y = a + bx$
Hera a - origin
b - scale
So
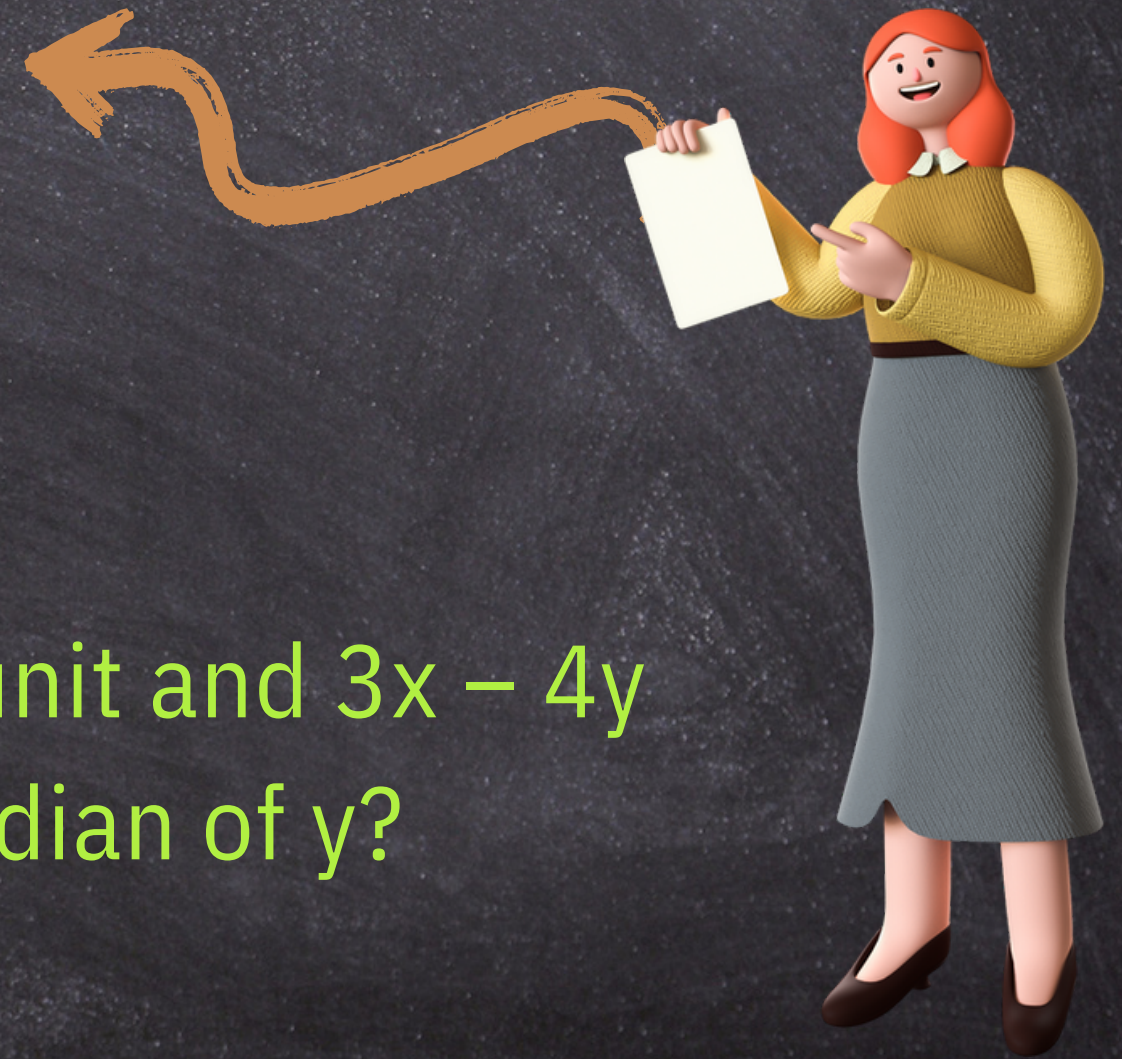
Q1. If Median of x is 5 unit then find Median of $(-2x+30)/10$?

Q2. If Median of x is 4 unit and $3x - 4y = 10$ then find Median of y?

(5) Median is property define but not descriptive.

(6) Median is not based on all observations and does not have some mathematical properties.

(7) Median has No affect due to presence of extreme observations. That's why Median is best central value for open-end classification.

Mode-

The most repeated value in any set of observations is known as " Mode ". It has a unit and also known as " frequently average "

For example-   the mode of following set of observation-

1,1,2,1,2,5,2,8,1,5,5,1,1,1,1,9,6,7,5,4,8,2,3,5,1,1,1,

Mode always shows the highest peak in Respect of Uniformity in respect of variability

Mode is the most popular measures of central tendency

- **In many cases Mode is not uniquely define.**

- It means in many cases there should be more than one mode and that case is known as " Case of Multi-modal ".

- Case of "Uni-modal"

- Case of "Bi-modal"

- Case of "Tri-modal"

- **In many cases Mode is not define.**

- It means in many cases Mode is not define.

- When all of obsevations of given data have same occurence then in that case mode can't define.

Discrete Series-

observations	Frequency

Continuous Series-

Class Interval	Frequency

- Mode can also obtained by a digrammatic presentation -" Histogram ".

In Calculation of Mode, Class interval must be uniform.

Mode has very low affect due to presence of extreme observations.

- Mode is not based on all observations so it does not have mathematical Properties.

- Mode is also affected due to change of origin and due to change of Scale.

Relationship Between MEAN , MEDIAN & MODE-

In case of Symmetrical-

Mean = Median = Mode

In case of Asymmetrical-

Mode = 3 Median - 2 Mean

Emperical Formula-

Mode = 3 Median - 2 Mean

Mean - Mode = 3 (Mean - Median)

Median - Mode = 2(Mean - Median)

1.A company creates a sinking fund of Rs. 2,00,000 in a bank account for 15 years bank offers interest rate 6% per annum the yearly payment to be paid by company is approximately ↔ (if need, use: 〖1.06〗^14=2.209) May 2022

The present value of Rs. 2,000 , after 8 years at the rate of 6% per annum, is =1.59385) .(〖1.06〗^8 ┤ May 2022

(a)   Rs. 8,945   (b) Rs.   8,145
(c)   Rs. 9,345   (d) Rs. 9,645

Q1. The mean marks of 50 students were found to be 40. Later on it was discovered that a score of 23 was misread as 63. Find the correct mean corresponding to the correct score.
(a) 39.2 (b) 37.4 (c) 40 (d) None

Q2.The average age of 30 boys of a class is equal to 14 years. When the age of the class-teacher is included, the average becomes 15 years or average increases by 1 yr. Find the age of the class- teacher.

(a) 45 yrs (b) 42 yrs

(c) 38 yrs (d) None

Q3. Average daily wages of workers in factory "X" and factory "Y" are respectively Rs. 300 and Rs.150. If average wages of 30 workers of factory A & B together is Rs.200. Find No. of workers of factory X & Y.
(a) 20; 10 (b)10;20
(c) 15 ; 15 (d) None

Q4. A person walks 9 hours at a speed of 30 km. per hr. and again walks 6 hrs. at a speed of 40 km. per hr. what is average speed in km. per hr.?
(a) 34 km./hr. (b) 31 km./hr.
(c) 35 km./hr. (d) None

Q5. If the relationship between x and y is given by 2x - 5y = 10 and mean of x = 16; then mean of Y is

(a) 4.4 (b) 3.2

(c) 5.2 (d) None

Q.6 For what value of n , the arithmetic mean of first n natural numbers is equal to {n+7}/3 .
(a) 11 (b) 8
(c) 13 (d) None of these.

Q.7 For a certain distribution, if ∑ (X - 20) = 25; ∑(X - 5) = 0; ∑(X - 0) = -5, then n is equal to:

(a) 20 (b) 25

(c) -25 (d) 35

Q8. If the A.M. and G.M. for two numbers are 34 and 16 respectively, then the two numbers are :
(a) 16 and 70 (b) 4 and 64
(c) 100 and 3 (d) None.

Q9. If the A.M. and H.M. for two numbers are 0.8 and 3.2 respectively then the G.M. will be :
(a) 1.6 (b) 2.10
(c) 3.05 (d) None

Q10. If G.M. of X is 5 and G.M. of Y is 12, then the G.M. of XY is

(a) 60 (b) log 5 × log 12

(c) log 60 (d) None of these.